# IMPORTANT INFORMATION

## Section 1B - Maintenance

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<tr>
<td>Power Steering System</td>
<td>1B-31</td>
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<tr>
<td>Checking Fluid Level</td>
<td>1B-31</td>
</tr>
<tr>
<td>Engine Warm</td>
<td>1B-31</td>
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<tr>
<td>Engine Cold</td>
<td>1B-31</td>
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<tr>
<td>Filling and Bleeding</td>
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</tbody>
</table>

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Tools

<table>
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<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing Light</td>
<td>91-99379</td>
</tr>
<tr>
<td>Quicksilver Scan Tool</td>
<td>91-823686A2</td>
</tr>
</tbody>
</table>

Lubricants / Sealants / Adhesives

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quicksilver Liquid Neoprene</td>
<td>92-25711--3</td>
</tr>
<tr>
<td>Quicksilver 2-4-C Marine Lubricant With Teflon</td>
<td>92-825407A3</td>
</tr>
<tr>
<td>Loctite Pipe Sealant With Teflon</td>
<td>Obtain Locally</td>
</tr>
<tr>
<td>Quicksilver U-Joint and Gimbal Bearing Grease</td>
<td>92-828052A2</td>
</tr>
</tbody>
</table>
Maintenance Schedules

Maintenance Intervals

Maintenance intervals and the tasks to be performed, as shown in this current schedule, or as found in a previously printed schedules, are generally based on an average boating application and environment. However, individual operating habits and personal maintenance preferences can have an impact on the suggested intervals. In consideration of these factors, Mercury MerCruiser has adjusted some maintenance intervals and corresponding tasks to be performed. In some cases, this may allow for more individual tasks to be performed in a single visit to the serving dealer, rather than multiple visits. Therefore, it is very important that the boat owner and servicing dealer discuss the current Maintenance Schedule and develop appropriate maintenance intervals to coincide with the individual operating habits, environment, and maintenance requirements.

Always disconnect battery cables from battery BEFORE working around electrical systems components to prevent injury to yourself and damage to electrical system should a wire be accidentally shorted.

Gas Sterndrive

<table>
<thead>
<tr>
<th>Routine Maintenance *</th>
<th>Each Day Start</th>
<th>Each Day End</th>
<th>Weekly</th>
<th>Every Two Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check crankcase oil (interval can be extended based on experience).</td>
<td>●★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If operating in salt, brachish or polluted waters, flush cooling system after each use.</td>
<td></td>
<td>●★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check drive unit oil level, trim pump oil level and power steering pump fluid level.</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
<tr>
<td>Check water pickups for debris or marine growth. Check water strainer and clean. Check coolant level.</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
<tr>
<td>Inspect drive unit anodes and replace if 50 percent eroded.</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
<tr>
<td>Inspect fuel pump sight tube and have pump replaced if fuel is present.</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
<tr>
<td>Check battery connections and fluid level.</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
<tr>
<td>Lubricate propeller shaft and the retorque nut (if operating in only freshwater, this maintenance may be extended to every four months).</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
<tr>
<td>Operating in Saltwater Only: treat engine surface with corrosion guard.</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
<tr>
<td>Clean air filter every 50 hours of operation.</td>
<td></td>
<td></td>
<td>●★</td>
<td></td>
</tr>
</tbody>
</table>

* Only perform maintenance which applies to your particular power package

● Standard Models
★ Horizon Models
### Gas Sterndrive (Continued)

#### Scheduled Maintenance *

<table>
<thead>
<tr>
<th>Maintenance Task</th>
<th>Every 100 hours or Annually</th>
<th>Every 200 hours or 3 years</th>
<th>Every 300 hours or 3 years</th>
<th>Every 2 years</th>
<th>Every 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch-up paint power package and spray with corrosion guard.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change crankcase oil and filter.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change drive unit oil and retorque connection of gimbal ring to steering shaft.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace fuel filter(s).</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check steering system and remote control for loose, missing or damaged parts.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect U-joints, splines and bellows. Check clamps.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect and lubricate gimbal bearing and engine coupler.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check continuity circuit for loose or damaged connections. Test MerCathode® unit output on Bravo Models.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retorque engine mounts.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check spark plugs, wires, distributor cap and ignition timing. Check and adjust idle speed.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean flame arrestor and crankcase ventilation hoses. Replace PCV valve.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check electrical system for loose, damaged or corroded fasteners.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect condition and tension of belts.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check cooling system and exhaust system hose clamps for tightness. Inspect both systems for damage or leaks.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disassemble and inspect seawater pump and replace worn components.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean seawater section of closed cooling system. Clean, inspect and test pressure cap.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace coolant.</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Only perform maintenance which applies to your particular power package
- Standard Models
- Horizon Models
- Whichever Occurs First
- Interval will be reduced if not using extended life coolant.

8 Lubricate engine coupler every 50 hour if operated at idle for prolonged periods of time.
## Gas Inboard

### Routine Maintenance *

<table>
<thead>
<tr>
<th>Maintenance Activity</th>
<th>Each Day Start</th>
<th>Each Day End</th>
<th>Weekly</th>
<th>Every Two Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check crankcase oil (interval can be extended based on experience).</td>
<td>★★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If operating in salt, brackish or polluted waters, flush cooling system after each use.</td>
<td></td>
<td>★★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check transmission fluid.</td>
<td></td>
<td></td>
<td></td>
<td>★★</td>
</tr>
<tr>
<td>Check water pickups for debris or marine growth. Check water strainer and clean. Check coolant level.</td>
<td></td>
<td></td>
<td></td>
<td>★★</td>
</tr>
</tbody>
</table>

* Only perform maintenance which applies to your particular power package

- Standard Models
- Horizon Models
<table>
<thead>
<tr>
<th>Maintenance Task</th>
<th>Every 100 hours or Annually</th>
<th>Every 200 hours or 3 years</th>
<th>Every 300 hours or 3 years</th>
<th>Every 2 years</th>
<th>Every 5 years</th>
<th>Per OEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch-up paint power package and spray with corrosion guard.</td>
<td>☆</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change crankcase oil and filter.</td>
<td>☆</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change transmission fluid.</td>
<td>☆</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace fuel filter(s).</td>
<td>☆</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check steering system and remote control for loose, missing or damaged parts.</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Retorque engine mounts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Check spark plugs, wires, distributor cap and ignition timing.</td>
<td></td>
<td></td>
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<td></td>
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<td>Clean flame arrestor and crankcase ventilation hoses. Replace PCV valve.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check electrical system for loose, damaged or corroded fasteners.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Inspect condition and tension of belts.</td>
<td></td>
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<td>Check cooling system and exhaust system hose clamps for tightness. Inspect both systems for damage or leaks.</td>
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<td>Disassemble and inspect seawater pump and replace worn components.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean seawater section of closed cooling system. Clean, inspect and test pressure cap.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace coolant.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check engine-to-propeller shaft alignment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Only perform maintenance which applies to your particular power package
- Standard Models
- Horizon Models
- Whichever Occurs First
- Interval will be reduced if not using extended life coolant.
### Engine and Tune-Up Specifications

#### MCM (Sterndrive)

<table>
<thead>
<tr>
<th>Model</th>
<th>MCM 5.0L ALPHA BRAVO</th>
<th>MCM 5.7L ALPHA BRAVO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propshaft Horsepower (SAV1 Rating)</td>
<td>220&lt;sup&gt;1&lt;/sup&gt;</td>
<td>250&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Propshaft Kilowatts (SAV1 Rating)</td>
<td>164&lt;sup&gt;1&lt;/sup&gt;</td>
<td>186&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Number of Cylinders</td>
<td>V-8</td>
<td></td>
</tr>
<tr>
<td>Displacement</td>
<td>305 cid (5.0 l)</td>
<td>350 cid (5.7 l)</td>
</tr>
<tr>
<td>Bore / Stroke - in. (mm)</td>
<td>3.74 x 3.48 (95 x 88.4)</td>
<td>4.0 x 3.48 (101.6 x 88.4)</td>
</tr>
<tr>
<td>Compression Ratio</td>
<td>9.4:1</td>
<td></td>
</tr>
<tr>
<td>Compression Pressure</td>
<td>Minimum 100 psi (690 kPa)&lt;sup&gt;7&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Idle rpm In Neutral&lt;sup&gt;3&lt;/sup&gt;</td>
<td>650 rpm&lt;sup&gt;5&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Maximum rpm (at WOT)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>4400-4800 rpm</td>
<td></td>
</tr>
<tr>
<td>Oil Pressure (at 2000 rpm)</td>
<td>Minimum 30 psi (207 kPa)</td>
<td></td>
</tr>
<tr>
<td>Minimum Oil Pressure (at Idle)</td>
<td>Minimum 4 psi (28 kPa)</td>
<td></td>
</tr>
<tr>
<td>Fuel Pressure (1800 rpm)</td>
<td>3-7 psi (21-48 kPa)</td>
<td></td>
</tr>
<tr>
<td>Electrical System</td>
<td>12 V Negative (–) Ground</td>
<td></td>
</tr>
<tr>
<td>Alternator Rating</td>
<td>55 or 65 amp&lt;sup&gt;8&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Minimum Battery Requirements</td>
<td>375 cca / 475 mca / 90 Ah</td>
<td></td>
</tr>
<tr>
<td>Firing Order</td>
<td>1-8-4-3-6-5-7-2</td>
<td></td>
</tr>
<tr>
<td>Spark Plug Type</td>
<td>AC - MR43LTS</td>
<td>Champion - RS12YC</td>
</tr>
<tr>
<td></td>
<td>NGK - BPR6EFS</td>
<td></td>
</tr>
<tr>
<td>Spark Plug Gap</td>
<td>.045 in. (1.1 mm)</td>
<td></td>
</tr>
<tr>
<td>Timing (at idle rpm)&lt;sup&gt;4&lt;/sup&gt;</td>
<td>10° BTDC</td>
<td></td>
</tr>
<tr>
<td>Preliminary Idle Mixture</td>
<td>1 1/4 Turns</td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>160° F (71° C)</td>
<td></td>
</tr>
</tbody>
</table>

---

2. Power Rated in Accordance with SAV1 rating procedures. This rating procedure is used to certify that the engine complies with “Stage 1” Bodensee and Swiss Regulations. Horsepower differences shown result from differences in test rpm, allowable test tolerances, and/or installation of special kit components.
3. Measured using an accurate service tachometer with engine at normal operating temperature.
4. Timing must be set using a special procedure as outlined in the appropriate section of this manual. Timing cannot be properly set using the conventional method.
5. A special procedure must be followed to adjust idle rpm. Consult your Authorized Mercury Mercruiser Dealer before attempting this procedure.
6. Idle speed on EFI models is not adjustable.
7. Minimum recorded compression in any one cylinder should not be less than 70 percent of the highest recorded cylinder.
8. Serial Number Break 65Amp starts at OL619000 and up.
### Engine and Tune-Up Specifications (Continued)

#### MCM (Sterndrive) (continued)

<table>
<thead>
<tr>
<th>Model</th>
<th>MCM 5.0L EFI ALPHA BRAVO</th>
<th>MCM 5.7L EFI ALPHA BRAVO</th>
<th>MCM 350 MAG MPI ALPHA BRAVO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propshaft Horsepower (SAV1 Rating)</td>
<td>230&lt;sup&gt;1&lt;/sup&gt;</td>
<td>260&lt;sup&gt;1&lt;/sup&gt;</td>
<td>300&lt;sup&gt;1&lt;/sup&gt; (275&lt;sup&gt;2&lt;/sup&gt;)</td>
</tr>
<tr>
<td>Propshaft Kilowatts (SAV1 Rating)</td>
<td>172&lt;sup&gt;1&lt;/sup&gt;</td>
<td>194&lt;sup&gt;1&lt;/sup&gt;</td>
<td>224&lt;sup&gt;1&lt;/sup&gt; (205&lt;sup&gt;2&lt;/sup&gt;)</td>
</tr>
<tr>
<td>Number of Cylinders</td>
<td>V-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement</td>
<td>305 cid (5.0 l)</td>
<td>350 cid (5.7 l)</td>
<td></td>
</tr>
<tr>
<td>Bore / Stroke - in. (mm)</td>
<td>3.74 x 3.48 (95 x 88.4)</td>
<td>4.0 x 3.48 (101.6 x 88.4)</td>
<td></td>
</tr>
<tr>
<td>Compression Ratio</td>
<td>9.4:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression Pressure</td>
<td>Minimum 100 psi (690 kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idle rpm In Neutral&lt;sup&gt;3&lt;/sup&gt;</td>
<td>600 rpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum rpm (at WOT)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>4400-4800 rpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Pressure (at 2000 rpm)</td>
<td>Minimum 30 psi (207 kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Oil Pressure (at Idle)</td>
<td>Minimum 4 psi (28 kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Pressure (1800 rpm)</td>
<td>30 psi (207 kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical System</td>
<td>12 V Negative (–) Ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternator Rating</td>
<td>55 or 65 amp&lt;sup&gt;8&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Battery Requirements</td>
<td>550 cca / 700 mca / 120 Ah</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firing Order</td>
<td>1-8-4-3-6-5-7-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spark Plug Type</td>
<td>AC - MR43LTS Champion - RS12YC NGK - BPR6EFS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spark Plug Gap</td>
<td>.045 in (1.1 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timing (at idle rpm)&lt;sup&gt;5&lt;/sup&gt;</td>
<td>8° BTDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>160° F (71° C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup> Power Rated in Accordance with NMMA (National Marine Manufacturers’ Association) rating procedures.

<sup>2</sup> Power Rated in Accordance with SAV1 rating procedures. This rating procedure is used to certify that the engine complies with “Stage 1” Bodensee and Swiss Regulations. Horsepower differences shown result from differences in test rpm, allowable test tolerances, and/or installation of special kit components.

<sup>3</sup> Measured using an accurate service tachometer with engine at normal operating temperature.

<sup>4</sup> Timing must be set using a special procedure as outlined in the appropriate section of this manual. Timing cannot be properly set using the conventional method.

<sup>5</sup> A special procedure must be followed to check or adjust idle rpm. Consult your Authorized Mercury MerCruiser Dealer before attempting this procedure.

<sup>6</sup> Idle speed on EFI models is not adjustable.

<sup>7</sup> Minimum recorded compression in any one cylinder should not be less than 70 percent of the highest recorded cylinder.

<sup>8</sup> Serial Number Break 65Amp starts at OL619000 and up.
## Engine and Tune-Up Specifications (Continued)

### MIE (Inboard and Ski)

<table>
<thead>
<tr>
<th>Model</th>
<th>MIE 5.7L</th>
<th>MIE 350 MAG MPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propshaft Horsepower (SAV1 Rating)</td>
<td>260¹</td>
<td>300¹ (290²)</td>
</tr>
<tr>
<td>Propshaft Kilowatts (SAV1 Rating)</td>
<td>194¹</td>
<td>224¹ (216²)</td>
</tr>
<tr>
<td>Number of Cylinders</td>
<td>V-8</td>
<td></td>
</tr>
<tr>
<td>Displacement</td>
<td>350 cid (5.7 l)</td>
<td></td>
</tr>
<tr>
<td>Bore / Stroke - in. (mm)</td>
<td>4.00 x 3.48 in. (101.6 x 88.4)</td>
<td></td>
</tr>
<tr>
<td>Compression Ratio</td>
<td>9.4:1</td>
<td></td>
</tr>
<tr>
<td>Compression Pressure</td>
<td>100 psi (690 kPa)³</td>
<td></td>
</tr>
<tr>
<td>Idle rpm In Neutral³</td>
<td>650 rpm⁵</td>
<td>600 rpm⁶</td>
</tr>
<tr>
<td>Maximum rpm (at WOT)</td>
<td>4200-4600 rpm³</td>
<td>4400-4800 rpm³</td>
</tr>
<tr>
<td>Oil Pressure (at 2000 rpm)</td>
<td>Minimum 30 psi (207 kPa)</td>
<td></td>
</tr>
<tr>
<td>Minimum Oil Pressure (at Idle)</td>
<td>4 psi (28 kPa)</td>
<td></td>
</tr>
<tr>
<td>Fuel Pressure (1800 rpm)</td>
<td>3-7 psi (21-48 kPa)</td>
<td>30 psi (207 kPa)</td>
</tr>
<tr>
<td>Electrical System</td>
<td>12 V Negative (–) Ground</td>
<td></td>
</tr>
<tr>
<td>Alternator Rating</td>
<td>55 or 65 amp ⁶</td>
<td></td>
</tr>
<tr>
<td>Minimum Battery Requirements</td>
<td>375 cca/475 mca/90 Ah</td>
<td>550 cca/700 mca/120 Ah</td>
</tr>
<tr>
<td>Firing Order</td>
<td>1-8-4-3-6-5-7-2</td>
<td>1-8-4-3-6-5-7-2</td>
</tr>
<tr>
<td>Spark Plug Type</td>
<td>AC - MR43LTS Champion - RSY9C NGK - BPR6EFS</td>
<td></td>
</tr>
<tr>
<td>Spark Plug Gap</td>
<td>.045 in. (1.1 mm)</td>
<td></td>
</tr>
<tr>
<td>Timing (at idle rpm)³</td>
<td>10° BTDC⁴</td>
<td>8° BTDC⁴</td>
</tr>
<tr>
<td>Preliminary Idle Mixture</td>
<td>1 1/4 Turns</td>
<td>Does Not Apply</td>
</tr>
<tr>
<td>Thermostat</td>
<td>160° F (71°C)</td>
<td></td>
</tr>
</tbody>
</table>

¹ Power Rated in Accordance with NMMA (National Marine Manufacturers' Association) rating procedures.
² Power Rated in Accordance with SAV1 rating procedures. This rating procedure is used to certify that the engine complies with "Stage 1" Bodensee and Swiss Regulations. Horsepower differences shown result from differences in test rpm, allowable test tolerances, and/or installation of special kit components.
³ Measured using an accurate service tachometer with engine at normal operating temperature.
⁴ Timing must be set using a special procedure as outlined in the appropriate section of this manual. Timing cannot be properly set using the conventional method.
⁵ A special procedure must be followed to adjust idle rpm. Consult your Authorized Mercury MerCruiser Dealer before attempting this procedure.
⁶ Idle speed on EFI models is not adjustable.
⁷ Minimum recorded compression in any one cylinder should not be less than 70 percent of the highest recorded cylinder.
⁸ Serial Number Break 65Amp starts at OL619000 and up.
## Engine and Tune-Up Specifications (Continued)

### SKI (Inboard)

<table>
<thead>
<tr>
<th>Model</th>
<th>5.7L SKI</th>
<th>350 MAG MPI SKI</th>
<th>BLACK SCORPION SKI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propshaft HorsePower (SAV1 Rating)</td>
<td>260&lt;sup&gt;1&lt;/sup&gt;</td>
<td>300&lt;sup&gt;1&lt;/sup&gt;</td>
<td>315&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Propshaft Kilowatts (SAV1 Rating)</td>
<td>194&lt;sup&gt;1&lt;/sup&gt;</td>
<td>224&lt;sup&gt;1&lt;/sup&gt;</td>
<td>235&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Number of Cylinders</td>
<td></td>
<td>V-8</td>
<td></td>
</tr>
<tr>
<td>Displacement</td>
<td></td>
<td>350 cid (5.7 l)</td>
<td></td>
</tr>
<tr>
<td>Bore / Stroke - in. (mm)</td>
<td>4.00 x 3.48 in. (101.6 x 88.4 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression Ratio</td>
<td></td>
<td>9:1</td>
<td></td>
</tr>
<tr>
<td>Compression Pressure</td>
<td></td>
<td>Minimum 100 psi (690 kPa)&lt;sup&gt;7&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Idle rpm In Neutral</td>
<td>650 rpm&lt;sup&gt;5&lt;/sup&gt;</td>
<td>600 rpm&lt;sup&gt;6&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Maximum rpm (at WOT)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>4400 - 4800</td>
<td>4600 - 5000</td>
<td>4800 - 5200</td>
</tr>
<tr>
<td>Oil Pressure (at 2000 rpm)</td>
<td>Minimum 30 psi (207 kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Oil Pressure (at Idle)</td>
<td>4 psi (28 kPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Pressure (1800 rpm)</td>
<td>3-7 psi (21-48 kPa)</td>
<td>30 psi (207 kPa)</td>
<td></td>
</tr>
<tr>
<td>Electrical System</td>
<td>12 V Negative (–) Ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Battery Requirements</td>
<td>375 cca / 475 mca / 90 Ah</td>
<td>550 cca / 700 mca / 120 Ah</td>
<td></td>
</tr>
<tr>
<td>Firing Order</td>
<td>1-8-4-3-6-5-7-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spark Plug Type</td>
<td>AC - MR43LTS</td>
<td>NGK - BPR6EFS</td>
<td>Champion - RS12YC</td>
</tr>
<tr>
<td>Spark Plug Gap</td>
<td>.045 in. (1.1 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timing (at idle rpm)</td>
<td>10° BTDC&lt;sup&gt;4&lt;/sup&gt;</td>
<td>8° BTDC&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Preliminary Idle Mixture</td>
<td>1 1/4 Turns</td>
<td>Does Not Apply</td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>160° F (71°C)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup> Power Rated in Accordance with NMMA (National Marine Manufacturers’ Association) rating procedures.

<sup>2</sup> Power Rated in Accordance with SAV1 rating procedures. This rating procedure is used to certify that the engine complies with “Stage 1” Bodensee and Swiss Regulations. Horsepower differences shown result from differences in test rpm, allowable test tolerances, and/or installation of special kit components.

<sup>3</sup> Measured using an accurate service tachometer with engine at normal operating temperature.

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<sup>6</sup> Idle speed on EFI models is not adjustable.

<sup>7</sup> Minimum recorded compression in any one cylinder should not be less than 70 percent of the highest recorded cylinder.

<sup>8</sup> Serial Number Break 65Amp starts at OL619000 and up.
Fluid Capacities

NOTICE

Unit Of Measurement: U.S. Quarts (Liters)
All capacities are approximate fluid measures.

Sterndrive Engines

<table>
<thead>
<tr>
<th>Model</th>
<th>MCM 305 cid / 5.0L and 350 cid / 5.7L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crankcase Oil (With Filter) 1</td>
<td>5.5 (5.25)</td>
</tr>
<tr>
<td>Seawater Cooling System 2</td>
<td>15 (14.1)</td>
</tr>
<tr>
<td>Closed Cooling System</td>
<td>20 (19)</td>
</tr>
</tbody>
</table>

1 Always use dipstick to determine exact quantity of oil or fluid required.
2 Seawater Cooling System capacity information is for winterization use only.

Inboard and Ski Engines

IMPORTANT: It may be necessary to adjust oil levels depending on installation angle and cooling systems (heat exchanger and fluid lines).

<table>
<thead>
<tr>
<th>Model</th>
<th>350 cid / 5.7L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crankcase Oil (With Filter) 1</td>
<td>5.5 (5.25)</td>
</tr>
<tr>
<td>Seawater Cooling System 2</td>
<td>15 (14.1)</td>
</tr>
<tr>
<td>Closed Cooling System</td>
<td>20 (19)</td>
</tr>
</tbody>
</table>

1 Always use dipstick to determine exact quantity of oil or fluid required.
2 Seawater Cooling System capacity information is for winterization use only.

Sterndrives

NOTICE

Unit Of Measurement: U.S. Fluid Ounces (Milliliters)
All capacities are approximate fluid measures.

<table>
<thead>
<tr>
<th>Model</th>
<th>ALPHA ONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Unit Oil Capacity (With Gear Lube Monitor)</td>
<td>64 (1892)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>BRAVO ONE</th>
<th>BRAVO TWO</th>
<th>BRAVO THREE</th>
<th>BLACK-HAWK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Unit Oil Capacity (With Gear Lube Monitor)</td>
<td>88 (2603)</td>
<td>104 (3076)</td>
<td>96 (2839)</td>
<td>80 (2365)</td>
</tr>
</tbody>
</table>
### Fluid Capacities (Continued)

#### Transmission

<table>
<thead>
<tr>
<th>Make and Model</th>
<th>Capacity</th>
<th>Fluid Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velvet Drive 71C In-Line</td>
<td>1-1/2 (1.33)</td>
<td>Mobil 424 or Dexron III Automatic Transmission Fluid Do Not Mix!</td>
</tr>
<tr>
<td>Velvet Drive 72 Series V-Drive</td>
<td>3 (2.75)</td>
<td>Mobil 424 or Dexron III Automatic Transmission Fluid Do Not Mix!</td>
</tr>
<tr>
<td>5000A</td>
<td>2-1/2 (2.4)</td>
<td>Dexron III Automatic Transmission Fluid</td>
</tr>
<tr>
<td>5000V</td>
<td>3 (2.75)</td>
<td></td>
</tr>
<tr>
<td>Walter V-Drive Model RV-36</td>
<td>3/4 (0.5)</td>
<td>SAE 30 Heavy Duty Motor Exxon Spartan, EP-68 Gear Oil, APG-80 Gear Oil</td>
</tr>
<tr>
<td>ZF (Hurtb)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>630V</td>
<td>4-1/4 (4.0)</td>
<td>Dexron III Automatic Transmission Fluid</td>
</tr>
<tr>
<td>630A</td>
<td>3-1/4 (3.0)</td>
<td></td>
</tr>
<tr>
<td>800A</td>
<td>5-3/4 (5.5)</td>
<td></td>
</tr>
</tbody>
</table>

1 Fluid should be circulated and then rechecked. Add additional fluid as necessary.

### NOTICE

Unit Of Measurement: U.S. Quarts (Liters)
All capacities are approximate fluid measures.

**NOTE:** Always use dipstick to determine exact quantity of fluid required.
20-Hour Break-In Period

IMPORTANT: The first 20 hours of operation is the engine break-in period. Correct break-in is essential to obtain minimum oil consumption and maximum engine performance. During this break-in period, the following rules must be observed:

• Do not operate below 1500 rpm for extended periods of time for first 10 hours. Shift into gear as soon as possible after starting and advance throttle above 1500 rpm if conditions permit safe operation.

• Do not operate at one speed consistently for extended periods.

• Do not exceed 3/4 throttle during first 10 hours. During next 10 hours, occasional operation at full throttle is permissible (5 minutes at a time maximum).

• Avoid full throttle acceleration from IDLE speed.

• Do not operate at full throttle until engine reaches normal operating temperature.

After Break-in Period

To help extend the life of your Mercury MerCruiser power package, the following recommendations should be considered;

• Use a propeller that allows the engine to operate at or near the top of the maximum rpm range (refer to “Specifications” section) when at full throttle with a normal boat load.

• Operation at 3/4 throttle setting or lower is recommended. Refrain from prolonged operation at maximum (full throttle) rpm.

End of First Season Checkup

At the end of the first season of operation, an Authorized Mercury MerCruiser Dealer should be contacted to discuss and/or perform various scheduled maintenance items. If you are in an area where the product is operated continuously (year-round operation), you should contact your dealer at the end of the first 100 hours of operation, or once yearly, whichever occurs first.
Specifications

Fuel Recommendations

IMPORTANT: Use of improper gasoline can damage your engine seriously. Engine damage resulting from use of improper gasoline is considered misuse of engine, and damage caused thereby will not be covered under the limited warranty.

FUEL RATINGS

Mercury MerCruiser engines will operate satisfactorily when using a major brand of unleaded gasoline as follows:

**USA and Canada** - having a posted pump Octane Rating of 87 (R+M)/2 minimum. Premium gasoline [92 (R+M)/2 Octane] is also acceptable. DO NOT use leaded gasoline.

**Outside USA and Canada** - having a posted pump Octane Rating of 90 RON minimum. Premium gasoline (98 RON) is also acceptable. If unleaded gasoline is not available, use a major brand of leaded gasoline.

USING REFORMULATED (OXGENATED) GASOLINES (USA ONLY)

This type of gasoline is required in certain areas of the USA. The two types of “oxygenates” used in these fuels is Alcohol (Ethanol) or Ether (MTBE or ETBE). If Ethanol is the “oxygenate” that is used in the gasoline in your area, refer to “Gasolines Containing Alcohol.” These “Reformulated Gasolines” are acceptable for use in your Mercury MerCruiser engine.

VAPOR LOCKING

Fuels containing alcohol and winter grade fuels will aggravate vapor lock problems. A vapor lock condition can be identified by the following problems:

- Engine starts and, upon advancing throttle, shuts off and will not restart.
- If engine does restart, it shuts off when advancing throttle.
- Engine is difficult to restart after operating the boat and then leaving the engine off for 1 to 3 hours.

Other factors may combine to increase vapor locking. These factors include but are not limited to:

- air temperature
- fuel tank location
- fuel supply system
- engine coolant temperature
- temperature and vacuum of fuel to engine
- engine compartment air temperature and ventilation

Other conditions should be ruled out before treating the problem as vapor locking.
GASOLINES CONTAINING ALCOHOL

If the gasoline in your area contains either “methanol” (methyl alcohol) or “ethanol” (ethyl alcohol), you should be aware of certain adverse effects that can occur. These adverse effects are more severe with “methanol.” Increasing the percentage of alcohol in the fuel can also worsen these adverse effects.

Some of these adverse effects are caused because the alcohol in the gasoline can absorb moisture from the air, resulting in a separation of the water/alcohol from the gasoline in the fuel tank.

The fuel system components on your Mercury MerCruiser engine will withstand up to 10% alcohol content in the gasoline. We do not know what percentage your boat’s fuel system will withstand. Contact your boat manufacturer for specific recommendations on the boats fuel system components (fuel tanks, fuel lines, and fittings). Be aware that gasolines containing alcohol may cause increased:

- Corrosion of metal parts.
- Deterioration of rubber or plastic parts.
- Fuel permeation through rubber fuel lines.
- Starting and operating difficulties.

**WARNING**

FIRE AND EXPLOSION HAZARD: Fuel leakage from any part of fuel system can be a fire and explosion hazard which can cause serious bodily injury or death. Careful periodic inspection of entire fuel system is mandatory, particularly after storage. All fuel components including fuel tanks, whether plastic metal or fiberglass, fuel lines, fittings, fuel filters and carburetors/fuel injection components should be inspected for leakage, softening, hardening, swelling or corrosion. Any sign of leakage or deterioration requires replacement before further engine operation.

Because of possible adverse effects of alcohol in gasoline, it is recommended that only alcohol-free gasoline be used where possible. If only fuel containing alcohol is available, or if the presence of alcohol is unknown, increased inspection frequency for leaks and abnormalities is required.

**IMPORTANT:** When operating a Mercury MerCruiser engine on gasoline containing alcohol, storage of gasoline in the fuel tank for long periods should be avoided. Long periods of storage, common to boats, create unique problems. In cars alcohol-blend fuels normally are consumed before they can absorb enough moisture to cause trouble, but boats often sit idle long enough for phase separation to take place. In addition, internal corrosion may take place during storage if alcohol has washed protective oil films from internal components.
Test For Alcohol Content In Gasoline

The following is an acceptable and widely used field procedure for the detection of alcohol in gasoline. Use any small transparent bottle or tube that can be capped and is, or can be, provided with graduations or a mark at about 1/3 full. A pencil mark on a piece of adhesive tape may be used.

PROCEDURE

1. Fill the container with water to the mark.
2. Add fuel almost to fill the container, leaving some air space, then cap the container. The proportions of fuel to water are not critical, but there should be 2 to 3 times as much fuel as water.
3. Shake container vigorously and allow it to sit upright for 3 to 5 minutes. If the volume of water appears to have increased, alcohol is present. If you are not sure, there is no need for concern. If the dividing line between water and fuel becomes cloudy, use the middle of the cloudy band.

Transmission Fluid

- **Velvet Drive** - Dexron III
- **Walter V-Drive** - SAE 30 Heavy Duty Motor, Exxon Spartan EP-68 Gear Oil or APG-80 Gear Oil.
- **Hurth** - Dexron III

Power Steering Fluid

Use Quicksilver Power Trim and Steering Fluid, or automatic transmission Fluid (ATF) Dexron III.

Coolant for Closed Cooling System

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol or Methanol base antifreeze or plain water, are not recommended for use in fresh water section of cooling system at any time.</td>
</tr>
</tbody>
</table>

We recommend that the coolant section of closed cooling system be filled with Extended Life Ethylene Glycol 5/100 Antifreeze/Coolant mixed 50/50 with purified water. In areas where the possibility of freezing does not exist, it is permissible to use a solution of rust inhibitor and water (mixed to manufacturer’s recommendations).

If any non-compatible coolant is added to this coolant, coolant must be changed every 2 years or 400 hours, whichever occurs first. All coolants other than Extended Life 5/100 Ethylene Glycol Antifreeze/Coolant must be changed every 2 years or 400 hours, whichever occurs first.

Mercury MerCruiser V-8 engines can use any type of permanent antifreeze or any brand antifreeze solution that meets GM specification 1825M.
Crankcase Oil

To help obtain optimum engine performance and to provide maximum protection, we strongly recommend the use of Quicksilver 4-Cycle 25W-40 Marine Engine Oil. This oil is a special blend of 25-weight and 40-weight oils for marine engines. If not available, a good grade, straight weight, detergent automotive oil of correct viscosity, with an API classification of SH,CF/CF-2, may be used.

In those areas where Quicksilver 4-Cycle 25W-40 Marine Engine Oil or a recommended straight weight oil are not available, a multiviscosity 20W-40 (SH, CF/CF-2) or, as a second but less preferable choice, 20W-50, with API service ratings of SH, CF/CF-2 may be used.

**IMPORTANT:** The use of non-detergent oils, multi-viscosity oils (other than Quicksilver 25W-40 or a good quality 20W-40 or 20W-50), synthetic oils, low quality oils or oils that contain solid additives are specifically not recommended.

The chart below is a guide to crankcase oil selection. The oil filter should always be changed with oil.

**Overfilled Crankcase Oil**

Overfilled crankcases (oil level being too high) can cause a fluctuation or drop in oil pressure and rocker arm “clatter” on Mercury MerCruiser engines. The over-full condition results in the engine crankshaft splashing and agitating the oil, causing it to foam (become aerated). The aerated oil causes the hydraulic valve lifters to “bleed down.” This, in turn, results in rocker arm “clatter” and loss of engine performance, due to the valves not opening properly.

Care must be taken when checking engine oil level. Oil level must be maintained between the ADD mark and the FULL mark on the dipstick. To ensure that you are not getting a “false reading,” make sure the following steps are done before checking the oil level.

- Boat “at rest” in the water, or
- If boat is on a trailer, raise or lower bow until the boat is setting at the approximate angle that it would be if setting “at rest” in the water.
- Allow sufficient time for oil to drain into the crankcase if engine has just been run or oil has just been added.
Checking Engine Oil Level / Filling

IMPORTANT: ENGINE CRANKCASE OIL MUST BE CHECKED AT INTERVALS SPECIFIED IN “MAINTENANCE SCHEDULE” CHART. It is normal for an engine to use a certain amount of oil in the process of lubrication and cooling of the engine. The amount of oil consumption is greatly dependent upon engine speed, with consumption being highest at wide-open-throttle and decreasing substantially as engine speed is reduced.

1. Stop engine and allow boat to come to a rest.
2. Allow oil to drain back into oil pan - approximately 5 minutes.
3. Remove dipstick.
4. Wipe clean and reinstall. Push dipstick all the way into dipstick tube.
5. Remove dipstick and note the oil level.
6. Oil level must be between the FULL or OP RANGE and ADD marks.
7. If oil level is below ADD mark, proceed to Steps 8. and 9.
8. Remove oil filler cap from valve rocker arm cover.
9. Add required amount of oil to bring level up to, but not over, the FULL mark on dipstick.

Changing Oil and Filter

1. Start engine and run until it reaches normal operating temperatures.

IMPORTANT: Change oil when engine is warm from operation, as it flows more freely, carrying away more impurities.

2. Stop engine.
3. Remove drain plug from oil pan or from oil drain hose.

NOTE: If drain plug is not accessible because of boat construction, oil may be removed through dipstick tube, using a Quicksilver Crankcase Oil Pump. (See Quicksilver Accessory Guide.)

4. After oil has drained completely, reinstall drain plug (if removed) and tighten securely.
5. Remove and discard oil filter and its sealing ring.
6. Coat sealing ring on new filter with engine oil, and install. Tighten filter securely (following filter manufacturer’s instructions). Do not overtighten.
7. Fill crankcase with oil. See “Specifications” for type of oil and quantity.
8. Start engine and check for leaks.
Changing Water Separating Fuel Filter

⚠️ WARNING

Be careful when changing water separating fuel filter. Gasoline is extremely flammable and highly explosive under certain conditions. Be sure ignition key is OFF. Do not smoke or allow spark or open flame in area when changing fuel filter. Wipe up any spilled fuel immediately.

⚠️ WARNING

Make sure no fuel leaks exist before closing engine hatch.

⚠️ CAUTION

The electric fuel pump and factory installed water separating fuel filter have been carefully designed to function properly together. Do not install additional fuel filters and/or water separating fuel filters between fuel tank and engine.

The installation of additional filters may cause:

- Fuel Vapor Locking
- Difficult Warm-Starting
- Piston Detonation Due to Lean Fuel Mixture
- Poor Driveability

**MCM (Sterndrive) Models**

1. Unsnap latch and slide top and bottom cover pieces from around the water separating fuel filter and bracket.

![Diagram showing fuel filter cover with label 'a' for fuel filter cover.]

    a - Fuel Filter Cover

*NOTE:* Top and bottom cover pieces are formed with a groove on each side that slides around the brackets outer edges.
2. Remove water separating fuel filter and sealing ring from mounting bracket and discard.

3. Coat sealing ring on new filter with motor oil.
4. Thread filter onto bracket and tighten securely by hand. Do not use a filter wrench.
5. Start and run engine.
6. Check filter connection for gasoline leaks. If leaks exist, recheck filter installation.
7. Install cover pieces around fuel filter. Be certain top part of cover latches to lower part.

**MIE (Inboard and Ski) Models**

1. Remove water separating fuel filter and sealing ring from mounting bracket and discard.
2. Coat sealing ring on new filter with motor oil.
3. Thread filter onto bracket and tighten securely by hand. Do not use a filter wrench.
4. Start and run engine.
5. Check filter connection for gasoline leaks. If leaks exist, recheck filter installation.
Power Steering System

Checking Fluid Level

ENGINE WARM

1. Stop engine. Position drive unit so that it is straight back.
2. Remove fill cap / dipstick from power steering pump and note fluid level.

3. Level should be between the FULL HOT mark and ADD mark on dipstick.

4. If level is below ADD mark, but fluid is still visible in pump reservoir, add required amount of Quicksilver Power Trim and Steering Fluid or automatic transmission fluid (ATF) Dexron III through fill cap opening, to bring level up to FULL HOT mark on dipstick. DO NOT OVERFILL.

5. If fluid is not visible in reservoir, a leak exists in the power steering system. Find cause and correct.

Engine Cold

1. With engine stopped, position drive unit so that it is straight back.
2. Remove fill cap / dipstick from power steering pump and note fluid level.
3. Level should be between FULL COLD mark and bottom of dipstick.

4. If level is below bottom of dipstick, but fluid is still visible in pump reservoir, add required amount of Quicksilver Power Trim and Steering Fluid or automatic Dexron III transmission fluid (ATF), through fill cap opening, to bring level up to FULL COLD mark on dipstick. DO NOT OVERFILL.

If fluid is not visible in reservoir, a leak exists in the power steering system. Find cause and correct.
Filling and Bleeding

IMPORTANT: Power steering system must be filled exactly as explained in the following to be sure that all air is bled from the system. All air must be removed, or fluid in pump may foam during operation and be discharged from pump reservoir. Foamy fluid also may cause power steering system to become spongy, which may result in poor boat control.

1. With engine stopped, position drive unit so that it is straight back.
2. Remove fill cap / dipstick from power steering pump.
3. Add Quicksilver Power Trim and Steering Fluid or Dexron III automatic transmission fluid (ATF), as required, to bring level up to FULL COLD mark on dipstick.

IMPORTANT: Use only Quicksilver Power Trim and Steering Fluid or Dexron III automatic transmission fluid (ATF), in power steering system.

4. Turn steering wheel back and forth to end of travel in each direction several times.
5. Recheck fluid level and add fluid, if necessary.
6. Install vented fill cap. Tighten securely.

CAUTION

DO NOT operate engine without water being supplied to seawater pickup pump, or pump impeller may be damaged and subsequent overheating damage to engine may result.

7. Start engine and run at fast idle (1000-1500 rpm) until engine reaches normal operating temperature. During this time, turn steering wheel back and forth to end of travel in each direction several times.
8. Position drive unit so that it is straight back and stop engine.
9. Remove fill cap from pump.
10. Allow any foam in pump reservoir to disperse.
11. Check fluid level and add fluid, as required, to bring level up to FULL HOT mark on dipstick. DO NOT OVERFILL.
12. Reinstall fill cap. Tighten securely.

IMPORTANT: Drive unit must be positioned straight back and power steering fluid must be hot to accurately check fluid level.

13. If fluid is still foamy (in Step 5), repeat Steps 7 through 12 until fluid does not foam and level remains constant.
Closed Cooling System

Checking Coolant Level

**CAUTION**
Allow engine to cool down before removing pressure cap. Sudden loss of pressure could cause hot coolant to boil and discharge violently. After engine has cooled, turn cap 1/4 turn to allow any pressure to escape slowly, then push down and turn cap all the way off.

1. Coolant level in heat exchanger should be full (to bottom of filler neck).

**IMPORTANT:** When reinstalling pressure cap, be sure to tighten it until it contacts on filler neck.

2. Coolant level should be between the ADD and FULL marks on coolant recovery reservoir with the engine at normal operating temperature.

![Coolant Recovery Reservoir](image)

**a** - Coolant Recovery Reservoir
Flushing System MCM (Sterndrive)

If engine is operated in salty, polluted or mineral-laden water, flush seawater cooling system (preferably after each use) to reduce corrosion and prevent the accumulation of deposits in the system. Thoroughly flush the seawater cooling system prior to storage.

**NOTE:** For additional protection against freezing and rust to the exhaust manifolds and other components, a 50-50 mixture of antifreeze and water can be run through the engine during Power Package Layup.

**BOAT OUT OF WATER**

1. Install flushing attachment over water pickup holes in gear housing as shown.
2. Attach a water hose between the flushing attachment and a water tap.

![Flushing Attachment Diagram]

- **a** - Flushing Attachment
- **b** - Hose

**WARNING**

When flushing, be certain the area around propeller is clear, and no one is standing nearby. To avoid possible injury, remove propeller.

**CAUTION**

Do not run engine above 1500 rpm when flushing. Suction created by seawater pick-up pump may collapse flushing hose, causing engine to overheat.

**CAUTION**

Watch temperature gauge on dash to ensure that engine does not overheat.

3. Partially open water tap (approximately 1/2 maximum capacity). DO NOT use full water pressure.
4. Place remote control in neutral, idle speed position, and start engine.
5. Operate engine at idle speed in neutral for 10 minutes, or until discharge water is clear, then stop engine.
1. Raise drive unit to full UP position.
2. Install flushing attachment over water pickup holes in gear housing as shown.
3. Attach a water hose between the flushing attachment and a water tap.

4. Lower drive unit to full IN position.

**CAUTION**

Do not run engine above 1500 rpm when flushing. Suction created by seawater pick-up pump may collapse flushing hose, causing engine to overheat.

**CAUTION**

Watch temperature gauge on dash to ensure that engine does not overheat.

5. Partially open water tap (approximately 1/2 maximum capacity). DO NOT use full water pressure.
6. Place remote control in neutral, idle speed position, and start engine.
7. Operate engine at idle speed in neutral for 10 minutes, then stop engine.
8. Shut off water tap.
9. Raise drive unit to full UP position.
10. Remove water hose and flushing attachment.
Flushing System MIE (Inboard and Ski)

**CAUTION**
If boat is in the water, seacock, if so equipped, must remain closed until engine is to be re-started, to prevent water from flowing back into cooling system and/or boat. If boat is not fitted with a seacock, water inlet hose must be left disconnected and plugged (to prevent water from flowing back into cooling system and/or boat). As a precautionary measure, attach a tag to the ignition switch or steering wheel of the boat with the warning: Open seacock or reconnect water inlet hose before starting engine.

**IMPORTANT:** If a seacock is to be installed for this purpose, valve used must have an internal cross-sectional area equal to or greater than water inlet hose to prevent restricting water flow during normal operation. A 1-1/4 in. (32 mm), or larger, brass ball valve or gate valve is recommended.

1. If boat is in water, close seacock, if so equipped, or disconnect and plug seawater inlet hose to prevent seawater from entering boat.
2. Remove inlet hose from seawater pickup pump.
3. Using an adaptor, connect a water hose from a water tap to seawater pump inlet.
4. Partially open water tap (approximately 1/3 maximum). Do not use full water pressure.
5. Place the remote control lever in neutral position and start engine.

**WARNING**
When flushing, be certain the area around propeller is clear, and no one is standing nearby. To avoid possible injury, remove propeller.

**CAUTION**
Do not run engine above 1500 rpm when flushing. Suction created by seawater pick-up pump may collapse flushing hose, causing engine to overheat.

**CAUTION**
Watch temperature gauge on dash to ensure that engine does not overheat.

6. Operate engine at idle speed in neutral for 10 minutes, or until discharge water is clear. Stop engine.
7. Shut off water tap. Remove water hose and adaptor from pump inlet and reconnect water inlet hose. Be sure to tighten hose clamp securely.

**IMPORTANT:** If boat is in the water, do not open water inlet valve until engine is to be restarted to prevent contaminated water from flowing back into engine. If boat is not fitted with a valve, leave water inlet hose disconnected and plugged.
Transmission Fluid

**NOTE:** Due to the various installation angles and oil cooler set-ups, it may be necessary to adjust oil level.

### WARNING

| Do not remove dipstick with engine running. Hot oil can cause burns. |

### CAUTION

| Clean around the area of the dipstick before removing. Small particles of dirt can cause damage to internal components and cause valves to stick. |

**IMPORTANT:** DO NOT allow fluid level to drop below the bottom line.

---

**TRANSMISSION WARM**

The transmission should be at operating temperature (190° maximum) to get an accurate oil level reading. Oil will expand when heated. Oil will drain back from the cooler. Expansion and drain-back can significantly affect oil level.

1. When the transmission is at operating temperature, place selector lever in neutral.
2. Shut off engine.
3. Carefully remove dipstick and wipe clean.
4. Immediately insert clean dipstick and read oil level.

**NOTE:** Oil level must be checked immediately after engine shut-down to prevent an incorrect reading. Oil drains back into the transmission from the cooler and cooler lines.

5. Add or remove oil as necessary until the oil is at the required mark.

---

**TRANSMISSION COLD**

**NOTE:** For ease of checking the oil prior to engine start-up, a cold oil level mark can be made. To find the cold oil level mark, the oil level must first be set according to the warm oil level checking procedure.

1. Let the boat sit overnight. Insert clean dipstick and read level.
2. Put a mark on the dipstick at the cold oil level.

**NOTE:** You can use the new mark to check the oil level when cold. If oil level adjustment is needed, add oil to the new mark. This procedure can be performed by the builder, dealer or owner to ease fluid checking procedure.
Lubrication

Throttle Cable

1. Lubricate pivot points and guide contact surfaces with SAE 30W motor oil.

2 Barrel Carbureted Models
   a - Pivot Points
   b - Guide Contact Surface

EFI Models

Shift Cable and Transmission Linkage

MCM (STERNDRIVE) MODELS

1. Lubricate pivot points and guide contact surfaces with SAE 30W motor oil.

Typical Shift Cable
   a - Pivot Points
   b - Guide Contact Surface
1. Lubricate pivot points and guide contact surfaces with SAE 30W motor oil.

Typical Shift Cable
   a - Pivot Points
   b - Guide Contact Surface

2. Lubricate detent ball and holes in lever with SAE 30W motor oil.

Typical In-Line Transmission
   a - Poppet Ball Locations
Engine Coupler/U-Joint Shaft Splines

**NOTE:** Engine coupler and shaft splines are greased with Quicksilver Engine Coupler Spline Grease, 92-816391A4; universal joints are greased with Quicksilver 2-4-C Marine Lubricant.

**NOTE:** Refer to Mercury MerCruiser Sterndrive Service Manual for sterndrive unit removal and installation, if necessary.

**IMPORTANT:** Sterndrive Unit does not have to be removed to grease coupler.

1. Lubricate engine coupler splines through grease fitting on coupler by applying approximately 8-10 pumps of grease from a typical hand-operated grease gun.

**Alpha Drive Coupler**
- a - Grease Fitting
- b - Quicksilver Engine Coupler Spline Grease

**Bravo Drive Coupler**
- a - Quicksilver Engine Coupler Spline Grease

**Typical Bravo Drive**
- a - Quicksilver Engine Coupler Spline Grease
Sterndrive Drive Shaft Extension Models

Transom End

Engine End

a - Grease Fitting

Starter Motor

MIE (INBOARD AND SKI) MODELS

⚠️ WARNING

When performing the following procedure, be sure to observe the following:

- Be sure that engine compartment is well ventilated and that no gasoline vapors are present to avoid the possibility of a fire.

- Be sure to ground coil high-tension wire to block. Failure to ground coil wire may cause damage to ignition coil in addition to being a safety hazard.

- Stay clear of all moving parts.

1. Remove ignition coil high-tension wire from distributor cap tower and ground it to engine block with jumper wire. While cranking engine with starter motor, lubricate starter motor front bushing through oil cover with motor oil or its equivalent. Reinstall coil high-tension wire.

2. Remove plastic plug from flywheel housing. Lubricate starter motor shaft with motor oil through hole in flywheel housing. Reinstall plastic plug.

a - Grease Fitting
Cleaning Flame Arrestor

**WARNING**
Avoid gasoline fire or explosion. Gasoline is extremely flammable and highly explosive under certain conditions. Be careful when cleaning flame arrestor and crankcase ventilation hoses. Be sure that ignition is OFF. DO NOT smoke or allow sources of spark or open flame in area when cleaning flame arrestor and crankcase ventilation hoses.

**WARNING**
Avoid gasoline fire or explosion. Gasoline is extremely flammable and highly explosive under certain conditions. NEVER use gasoline as a cleaning solvent.

### Top Mounted Flame Arrestor

1. Remove crankcase ventilation hose from fitting on side of flame arrestor housing.
2. Remove flame arrestor.

### Early Bracket Models

- Flame Arrestor

5. Inspect crankcase ventilation hose for cracks or deterioration and replace if necessary.
6. Reinstall flame arrestor and and crankcase ventilation hose.
7. Reinstall flame arrestor screws and tighten securely.

### Later Throttle Body Stud Models

### Early Clamp Models

### Horizon Models
Black Scorpion Flame Arrestor

1. Remove clamp or nut, as applicable.
2. Remove crankcase ventilation hose.
3. Remove flame arrestor.

Earlier Style Flame Arrestor

- a - Flame Arrestor
- b - Clamp
- c - Vent Hose

Later Style Flame Arrestor

- a - Flame Arrestor
- b - Nut
- c - Vent Hose

6. Inspect crankcase ventilation hoses for cracks or deterioration, and replace if necessary.
7. Install flame arrestor and related components.
8. Tighten clamp or nut securely.
Serpentine Drive Belt

Component Location

⚠️ WARNING
Avoid possible serious injury. Make sure engine is shut off and ignition key is removed before inspecting belt.

IMPORTANT: MIE ENGINES ONLY: The brackets and washers on the 3 idler pulleys must be in a certain order or the belt will come off of the serpentine belt. All pulleys are referenced as though you were standing in front of the engine looking at the belt.

- Upper Right Idler Pulley Bracket Stud: Stud is threaded into the cylinder head. From the cylinder head is a nut, a flat washer, the lifting eye bracket, the oil cooler bracket, the idler pulley bracket and then a nut.

- Upper Left Idler Pulley Bracket Bolt: From the cylinder head is an idler pulley bracket, a flat washer, the heat exchanger bracket, a flat washer and the head of the bolt.

- Lower Idler Pulley Bracket Bolt: From the cylinder block is an idler pulley bracket and then the head of the bolt.
NOTE: Some models will have components arranged in a different order. All configurations are not shown. Checking, replacing and adjustment procedures are the same.

Typical Inboard Model
a - Idler Pulley
b - Seawater Pump Pulley
c - Crankshaft Pulley
d - Circulating Pump Pulley
e - Alternator Pulley

Typical Sterndrive Model
a - Idler Pulley
b - Seawater Pump Pulley
c - Crankshaft Pulley
d - Circulating Pump Pulley
e - Alternator Pulley
Inspection

1. Inspect drive belt for the following:
   - Excessive wear
   - Cracks

   **NOTE:** Minor, transverse cracks (across the belt width) may be acceptable. Longitudinal cracks (in direction of belt length) that join transverse cracks are NOT acceptable.
   - Fraying
   - Glazed surfaces

Replacing and/or Adjusting Tension

REMOVAL

1. Loosen 5/8 in. locking nut on adjustment stud.
2. Turn adjustment stud and loosen belt.
3. Remove drive belt.

INSTALLATION AND ADJUSTMENT

4. Install drive belt on pulleys.
5. Adjust tension by loosening 5/8 in. locking nut on adjustment stud. Leave wrench on adjustment stud.

   **NOTE:** Belt deflection is to be measured on the belt at the location that has the longest distance between two (2) pulleys. Proper tension is 1/4 in. (6 mm) deflection with moderate thumb pressure.

6. Use 5/16 in. socket and tighten adjusting stud until the correct deflection of the belt is obtained at location specified above.
7. While holding adjustment stud at the correct belt tension, tighten 5/8 in. locking nut.
8. Run engine for a short period of time and recheck belt adjustment.

Ignition Timing

Thunderbolt V Models

1. Connect timing light to number 1 spark plug wire.
2. Connect a shop tachometer to the engine.

**IMPORTANT:** Before starting the engine, connect a jumper wire from the ignition timing lead to a good ground. This has to be done before the ignition key is turned ON to lock the ignition module into Base Timing Mode.

3. Before starting the engine, connect jumper wire from timing lead to a good ground.

**NOTE:** The PUR/WHT timing lead is located towards the front of the engine near the fuel line or near the distributor, as equipped for your model.

4. Start engine and run at 1300 rpm until it reaches normal operating temperature.
5. Disconnect throttle cable from the carburetor.
6. With engine at idle rpm, adjust the carburetor idle rpm screw to the specified engine idle rpm.
7. With the engine still at idle rpm, check the ignition timing. If incorrect, rotate the distributor until timing is correct. Torque clamping screw to 18 lb-ft (25 Nm).
8. Adjust the idle mixture screw. Inward is LEAN, outward is RICH.
9. Recheck ignition timing.
10. Stop engine. Remove timing light, jumper wire and shop tachometer.

**IMPORTANT:** Timing jumper wire has to be removed or the ignition module will stay locked in the Base Timing Mode and it will not be able to advance the ignition timing correctly when the engine rpm is increased.

11. Adjust and reinstall throttle cable. Open and close remote control throttle lever to make sure that the carburetor’s throttle lever returns against the rpm adjusting screw every time.
12. Restart the engine, increase rpm to 1300 then return to idle position slowly and shut the engine off. Ensure that the carburetor throttle lever came back against the idle rpm screw.


**EFI/MPI Models**

1. Connect timing light to number 1 spark plug wire.
2. Start engine and run at 1300 rpm until it reaches normal operating temperature.
3. Stop engine and connect the scan tool or timing tool to the DLC connector on the EFI/ MPI wiring harness.
4. Start engine, allow rpm to stabilize.

**NOTE:** MEFI-1 models only, manually adjust remote control throttle lever to get 1200 engine rpm.

**NOTE:** MEFI-2 and MEFI-3 models only, ECM will automatically adjust engine rpm to approximately 1200 rpm when put in the service mode on a scan tool or when using the timing tool.

5. Check ignition timing. If incorrect, rotate the distributor until timing is correct. Torque clamping screw to 18 lb-ft (25 Nm).
6. Recheck ignition timing.
7. Disconnect scan tool or timing tool from DLC connector.
8. If required, return remote control throttle lever to idle position and shut off engine.
9. Restart engine, increase rpm to 1300 then return to idle position slowly. Ensure that engine returns to idle rpm. Readjust throttle cable, if required.
10. Shut engine off.
## Cold Weather or Extended Storage

### Precautions

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE CAREFUL while working on fuel system; gasoline is extremely flammable and highly explosive under certain conditions. Be sure that ignition key is OFF and do not smoke or allow sources of spark and/or open flames in the area.</td>
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<tbody>
<tr>
<td>Avoid Fire or Explosion: To prevent a potential fire hazard, be sure that engine compartment is well ventilated and that there are no gasoline vapors present during starting or fogging of engine.</td>
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</thead>
<tbody>
<tr>
<td>Avoid Fire or Explosion: Fuel injection system is pressurized during operation. Use care when removing water separating fuel filter. Fuel could spray on hot engine causing fire or explosion. Allow engine to cool down before attempting to remove the water separating fuel filter in the following procedure. Also, hold a clean shop towel over the water separating fuel filter when removing it to help avoid fuel spraying on the engine.</td>
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<td>If boat is in the water, seacock (water inlet valve), if equipped, must be closed until engine is to be restarted, to prevent water from flowing back into cooling system and/or boat. If boat is not fitted with a seacock, water inlet hose must be disconnected and plugged to prevent water from flowing back into cooling system and/or boat. As a precautionary measure attach a tag to the ignition switch or steering wheel of the boat with the warning that the seacock must be opened or the water inlet hose reconnected prior to starting engine.</td>
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<td>DO NOT operate engine without water flowing through seawater pickup pump, as pump impeller may be damaged and subsequent overheating damage to engine or sterndrive unit may result.</td>
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<tr>
<td>If engine is equipped with Closed Cooling System, Closed Cooling section must be kept filled with a solution of ethylene glycol antifreeze and water (mix antifreeze to manufacturer’s recommended proportions to protect engine to lowest temperature to which it will be exposed). DO NOT USE PROPYLENE GLYCOL antifreeze in closed cooling section. Seawater section, however, must be drained completely.</td>
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<tr>
<td>A discharged battery can be damaged by freezing.</td>
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</table>
CAUTION
Seawater section of cooling system MUST BE COMPLETELY drained for winter storage, or immediately after cold weather use, if the possibility of freezing temperatures exists. Failure to comply may result in trapped water causing freeze and/or corrosion damage to engine.

IMPORTANT: Observe the following information to ensure complete draining of cooling system.

• Engine must be as level as possible.

• A wire should be repeatedly inserted into all drain holes to ensure there are no obstructions in passages.

IMPORTANT: To prevent threads in manifolds, elbows and cylinder blocks from rusting during storage, reinstall drain plugs. Never leave drain plugs out during storage.

NOTE: If possible, place a container under drains and hoses to prevent water from draining into boat.

Power Package Layup

NOTICE
Refer to “Cold Weather or Extended Storage,” “Precautions,” in this section, BEFORE proceeding.

IMPORTANT: Mercury MerCruiser strongly recommends that this service be performed by an Authorized Mercury MerCruiser Dealer. Damage caused by freezing IS NOT covered by the MerCruiser Limited Warranty.

1. Fill fuel tank(s) with fresh gasoline that does not contain alcohol and a sufficient amount of Quicksilver Gasoline Stabilizer for Marine Engines to treat gasoline. Follow instructions on container.

2. If boat is to be placed in storage with fuel containing alcohol in fuel tanks (if fuel without alcohol is not available): Fuel tanks should be drained as low as possible and Quicksilver Gasoline Stabilizer for Marine Engines added to any fuel remaining in the tank. Refer to “Fuel Requirements” for additional information.

NOTE: If desired, a portable fuel tank can be used to perform the remainder of the power package layup procedures. Be sure to add an appropriate amount of Gasoline Stabilizer to the portable tank.

3. Run engine sufficiently to bring it up to normal operating temperature and allow fuel with Quicksilver Gasoline Stabilizer to circulate through fuel system.

4. Shut off engine.

5. Change oil and oil filter.

6. Flush cooling system. Refer to “Flushing Cooling System” procedure.

7. Close the fuel shutoff valve, if equipped. If no fuel shutoff valve is present, a suitable method must be employed to STOP the flow of fuel from the fuel tank to the engine before proceeding.
8. Prepare EFI fuel system for extended storage as follows:
   a. Allow engine to cool down.
   b. Remove the water separating fuel filter.
   c. Pour out a small amount of fuel into a suitable container, then add approximately 2 fluid ounces (60 ml) of Quicksilver 2-Cycle Outboard Oil to fuel in the water separating fuel filter.
   d. Reinstall water separating fuel filter.
   e. Start and operate engine at idle speed until the water separating fuel filter and fuel injection system are empty and engine stops.
   f. Remove and discard water separating fuel filter.
   g. Install new filter.

   a - Water Separating Fuel Filter

9. Prepare carbureted fuel system for extended storage as follows:
   a. Remove flame arrestor assembly and start engine.
   b. While operating engine at fast idle (1000-1500 rpm), fog internal surfaces of induction system and combustion chambers by squirting approximately 8 ounces (227 grams) of Quicksilver Storage Seal or SAE 20W engine oil into carburetor bores.
   c. Squirt the remaining 2 ounces (57 g) of Storage Seal (or oil) rapidly into carburetor, just as the engine begins to stall, due to lack of fuel. Allow engine to stop.
   d. Turn ignition key to OFF position.
   e. Refer to “Flushing Cooling System” and appropriately remove water supply to the seawater pickup pump.

10. Clean flame arrestor and crankcase ventilation hoses and reinstall.

11. Lubricate all items listed in “Lubrication” section.

12. Drain seawater section of cooling system as outlined in “Draining Instructions” section.

13. **On Models with Closed Cooling System:** Test coolant to ensure that it will withstand the lowest temperature expected during storage.

14. Service batteries per manufacturer’s instructions.

15. Clean outside of engine and repaint any areas required with Quicksilver Primer and Spray Paint. After paint has dried, spray Quicksilver Corrosion and Rust Preventive Type II or wipe down with Quicksilver Storage Seal or SAE 20W engine oil.

16. For sterndrive unit layup, refer to appropriate sterndrive service manual.

**NOTE:** For additional protection against freezing and rust to the exhaust manifolds and other components, a 50-50 mixture of antifreeze and water can be run through the engine during Power Package Layup.
Draining Instructions

DRAINING SEAWATER (RAW-WATER) COOLED MODELS

NOTICE
Refer to “Cold Weather or Extended Storage Precautions” in this section, BEFORE proceeding.

MCM (Sterndrive) Models:
1. Engine must be as level as possible to ensure complete draining of cooling system.
2. Remove drain plugs from bottom of port and starboard manifold fittings.
3. Remove drain plugs (port and starboard) from cylinder block, or cylinder block Y-fitting.

CAUTION
Avoid product damage. Do not disturb the Y-fitting when removing the drain plug. There is an ignition control “Knock Sensor” in the upper hole of the fitting. This sensor must not be loosened or removed. It is tightened to a critical specification at the factory.

Starboard Side Shown (Port Similar)
- a - Exhaust Elbow Drain Plug
- b - Cylinder Block Drain Plug
- c - Y-Fitting (Fuel Injected Only)
- d - Cylinder Block Drain Plug (Fuel Injected Only)
- e - Knock Sensor
4. Repeatedly clean out drain holes using a stiff piece of wire. Do this until entire system is drained.

**NOTE:** It may be necessary to lift, bend, or lower hoses to allow water to drain completely when hoses are disconnected.

5. Remove the engine water circulating pump hose or drain plug if equipped as shown.

6. Remove the drain plug from the water tube or Cool Fuel System cooler if equipped.

7. Remove seawater pump inlet hose as shown.

8. Crank engine over slightly with starter motor to purge any water trapped in seawater pickup pump. **DO NOT ALLOW ENGINE TO START.**
9. After seawater section of cooling system has been drained completely:
   a. Install all drain plugs and tighten securely.
   b. Reconnect hoses and tighten all hose clamps securely.
   c. **If NOT equipped with seacock:** Seawater inlet hose must remain disconnected and plugged until engine is to be restarted.

**IMPORTANT:** Mercury MerCruiser recommends that propylene glycol antifreeze (nontoxic and biodegradable) be used in sea-water section of the cooling system for cold weather or extended storage. Make sure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use in marine engines. Be certain to follow the propylene glycol manufacturer’s recommendations.

10. For additional assurance against freezing and corrosion in the internal water passages:
   a. Remove the thermostat cover and thermostat.
   b. Fill the engine seawater cooling system with a mixture of antifreeze and tap water mixed to manufacturer’s recommendation to protect engine to the lowest temperature to which it will be exposed during cold weather or extended storage.
   c. Using a new gasket, reinstall thermostat and cover. Tighten cover bolts to 30 lb-ft (41 Nm).

**NOTE:** Hoses shown removed for visual clarity. Do not remove hoses.

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**Diagram:**
- **a** - Housing
- **b** - Gasket
- **c** - Thermostat
- **d** - Spacer
- **e** - Fill Here

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**Index**
**NOTICE**

Refer to “Cold Weather or Extended Storage Precautions” in this section, BEFORE proceeding.

1. Engine must be as level as possible to ensure complete draining of cooling system.
2. Remove drain plugs from bottom of port and starboard manifold fittings.
3. Remove drain plugs (port and starboard) from cylinder block, or cylinder block Y-fitting.

**CAUTION**

Avoid product damage. Do not disturb the Y-fitting when removing the drain plug. There is an ignition control “Knock Sensor” in the upper hole of the fitting. This sensor must not be loosened or removed. It is tightened to a critical specification at the factory.

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**Starboard Side Shown (Port Similar)**

- a - Exhaust Elbow Drain Plug
- b - Cylinder Block Drain Plug
- c - Y-Fitting (Fuel Injected Only)
- d - Cylinder Block Drain Plug (Fuel Injected Only)
- e - Knock Sensor
4. Repeatedly clean out drain holes using a stiff piece of wire. Do this until entire system is drained.

**NOTE:** It may be necessary to lift, bend, or lower hoses to allow water to drain completely when hoses are disconnected.

5. Remove the engine water circulating pump hose or drain plug if equipped as shown.

6. Remove the drain plug from the water tube (some carbureted models) or Cool Fuel System cooler (fuel injected models).

7. Remove both hoses from the seawater pump.

8. Crank engine over slightly with starter motor to purge any water trapped in seawater pickup pump. DO NOT ALLOW ENGINE TO START.
9. After seawater section of cooling system has been drained completely:
   a. Install all drain plugs and tighten securely.
   b. Reconnect hoses and tighten all hose clamps securely.
   c. **If NOT equipped with seacock:** Seawater inlet hose must remain disconnected and plugged until engine is to be restarted.

**IMPORTANT:** Mercury MerCruiser recommends that propylene glycol antifreeze (nontoxic and biodegradable) be used in sea-water section of the cooling system for cold weather or extended storage. Make sure that the propylene glycol antifreeze contains a rust inhibitor and is recommended for use in marine engines. Be certain to follow the propylene glycol manufacturer’s recommendations.

10. For additional assurance against freezing and corrosion in internal water passages:
   a. Remove the thermostat cover and thermostat.
   b. Fill the engine seawater cooling system with a mixture of antifreeze and tap water mixed to manufacturer’s recommendation to protect engine to the lowest temperature to which it will be exposed during cold weather or extended storage.
   c. Using a new gasket, reinstall thermostat and cover. Tighten cover bolts to 30 lb-ft (41 Nm).

**NOTE:** Hoses shown removed for visual clarity. Do not remove hoses.

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**Index**

- Housing
- Gasket
- Thermostat
- Spacer
- Fill Here
MCM (Sterndrive) Models

NOTICE

Refer to “Cold Weather or Extended Storage Precautions” in this section, BEFORE proceeding.

IMPORTANT: Drain seawater section of closed cooling system only.

1. Engine must be as level as possible to ensure complete draining of cooling system.

   NOTE: Only if Extended Life 5/100 Ethylene Glycol Antifreeze/Coolant is used. If any non-compatible coolant is added to this coolant, coolant must be changed every 2 years or 400 hours, whichever occurs first. All coolants other than Extended Life 5/100 Ethylene Glycol Antifreeze/Coolant must be changed every 2 years or 400 hours, whichever occurs first.

2. Remove drain plug from bottom of port and starboard exhaust manifolds.

3. Remove the drain plug from the water tube or Cool Fuel System cooler if equipped.

   NOTE: It may be necessary to lift, bend, or lower hoses to allow water to drain completely when hoses are disconnected.
4. Remove seawater pump inlet hose.

5. Remove end caps, sealing washers and gaskets from the heat exchanger. Allow tubes to drain.

6. Repeatedly clean out drain holes using a stiff piece of wire. Do this until entire system is drained.

7. After seawater section of cooling system has been drained completely:
   a. Install all drain plugs and tighten securely.
   b. Reconnect hoses and tighten all hose clamps securely.
   c. Apply Quicksilver Perfect Seal to both sides of new end plate gaskets.
   d. Assemble new gaskets, new sealing washers and end plates onto heat exchanger. Torque end plate screws to 36-72 lb-in. (4-8 Nm).
   e. **If NOT equipped with seacock:** Seawater inlet hose must remain disconnected and plugged until engine is to be restarted.
DRAINING SEAWATER SECTION OF CLOSED COOLED (COOLANT) MODELS

MIE (Inboard and Ski) Models

**NOTICE**
Refer to “Cold Weather or Extended Storage Precautions” in this section, BEFORE proceeding.

1. Ensure that the boat is as level as possible to ensure complete draining of cooling system.
2. Remove drain plugs (port and starboard) from bottom of exhaust manifolds.

![Diagram](image1)

**a** - Drain Plug

3. Remove the drain plug from the water tube or Cool Fuel System cooler if equipped.

![Diagram](image2)

some carbureted models

**a** - Drain Plug

4. Loosen hose clamps and remove both hoses from seawater pickup pump as shown.

![Diagram](image3)

**a** - Seawater Inlet Hose
**b** - Hose To Cooler
5. Remove end caps, sealing washers and gaskets from the heat exchanger. Allow tubes to drain.

a - Heat Exchanger  
b - Sealing Washer  
c - End Cap  
d - Gasket

**IMPORTANT:** Use compressed air to blow any remaining water from the tubes in the heat exchanger.

6. Repeatedly clean out drain holes using a stiff piece of wire. Do this until entire system is drained.

7. Crank engine over slightly with starter motor to purge any water trapped in seawater pickup pump. **DO NOT ALLOW ENGINE TO START.**

8. After seawater section of cooling system has been drained completely:
   a. Except blue colored drain plugs with seals, coat threads of drain plugs with Quicksilver Perfect Seal. Install all drain plugs and tighten securely.
   b. Apply Quicksilver Perfect Seal to both sides of new end plate gaskets. Assemble new gaskets, new sealing washers and end plates onto heat exchanger. Torque end plate screws to 36-72 lb-in. (4-8 Nm).
   c. Reconnect all hoses and tighten hose clamps securely.
   d. **If NOT equipped with seacock:** Seawater inlet hose must remain disconnected and plugged until engine is to be restarted.
**Notices**

**Predelivery Preparation Instructions Must Be Performed Before Delivering Boat To The Product Owner.**

1. **On Bravo Drive Equipped Models:** Insert a small wire (repeatedly) to make sure that speedometer pitot tube, anode cavity vent hole, and anode cavity drain passage are unobstructed and drained.

   ![Diagram of Bravo Drive Equipped Models](image1)

   **Typical**
   - a - Speedometer Pitot Tube
   - b - Anode Cavity Vent Hole
   - c - Anode Cavity Drain Passage
   - d - Gear Housing Water Drain Hole (One Each - Port and Starboard)
   - e - Gear Housing Cavity Vent Hole
   - f - Gear Housing Cavity Drain Hole

2. **On Alpha Drive Equipped Models:** Insert a small wire (repeatedly) to make sure that speedometer pitot tube, trim tab cavity vent hole, and trim tab cavity drain passage are unobstructed and drained.

   ![Diagram of Alpha Drive Equipped Models](image2)

   **Typical**
   - a - Speedometer Pitot Tube
   - b - Trim Tab Cavity Vent Hole
   - c - Trim Tab Cavity Drain Passage
   - d - Gear Housing Water Drain Hole (One Each - Port and Starboard)
   - e - Gear Housing Cavity Vent Hole
   - f - Gear Housing Cavity Drain Hole
Recommissioning

**NOTICE**

Refer to “Cold Weather or Extended Storage Precautions” in this section BEFORE proceeding.

1. Ensure that all cooling system hoses are connected and tight.
2. Ensure all petcocks and drain plugs are installed and tight.
3. Inspect serpentine drive belt for condition and proper tension.
4. Perform all lubrication and maintenance specified for completion “Annually” and “Every 100 hours or Annually” in maintenance schedule, except items which were performed at time of engine layup.
5. For sterndrive unit recommissioning, refer to appropriate Sterndrive Service Manual.

**CAUTION**

When installing battery (in next step), be sure to connect positive battery cable to positive (+) terminal and negative (grounded) battery cable to negative (–) battery terminal. If battery cables are reversed, damage to electrical system WILL result.

6. Install fully charged battery. Clean battery cable clamps and terminals to help retard corrosion.

**CAUTION**

DO NOT operate engine without cooling water being supplied to seawater pickup pump or water pump impeller will be damaged and subsequent overheating damage to engine may result.

7. Start engine and closely observe instrumentation to ensure that all systems are functioning properly.
8. Carefully inspect entire engine for fuel, oil, water and exhaust leaks.
9. Check steering system, shift and throttle controls for proper operation.